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* minor changes may be made to this outline prior to publication
FEEDSTOCK MARKETS

- World resources of titanium minerals, including charts and written summary for major producing countries.
- Processing technologies for pigment production are explained including flowcharts.
- Other end-uses for titanium raw materials outlined.

HISTORICAL INFORMATION

This section provides historical perspective from 1789 until after the global financial crisis of 2008.
DEMAND AND PRICING

- Pricing for titanium feedstock products and outlook for the following two years.

- Analysis of activity in the feedstock sector plus major producers supply and demand dynamics.
Included in this section is a breakdown of supply by country, by product type and by major suppliers. Production figures for the past 4 years are identified, plus forecasting for the following 2 years.

Production statistics from the top 10 countries

Chloride versus sulfate feedstock supply: 2010–2012

2012 supply up 4% y-o-y

TRENDS AND OUTLOOK

Trends observed in 2012 analysed and assessed for impact on the feedstock sector.

Trade analysis

Supply and demand forecasts

Feedstock pricing
The feedstock sector underwent a period of consolidation in 2012, following the prior two years which were marked by significant supply challenges and rapidly rising prices for all feedstocks.

This section discusses the challenges faced in 2012 and the outlook through to 2014.
APPENDICES

APPENDIX 1
Introduction to the TiO₂ industry

APPENDIX 2
Producer profiles
Includes profiles for 29 major producers

APPENDIX 3
New projects profiles
Includes profiles for 33 new projects

Indian Rare Earths Limited

Ownership
Indian Government (Department of Atomic Energy)

Address
Plot No 1207 Veer Savakar Marg near Siddhi Vinayak Temple Prabhadevi, Mumbai 400 028

Website: irel.gov.in
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Background
Indian Rare Earths Limited (IRE) was incorporated in August 1950 as a private limited company jointly owned by the Government of India and Government of Travancore, Cochin, with the primary intention of taking up commercial scale processing of monazite sand at its first unit namely Rare Earths Division (RED), Aluva, Kerala for the recovery of thorium. After becoming a fully-fledged Central Government Undertaking in 1963 under the administrative control of Department of Atomic Energy (DAE), IREL took over a number of private companies engaged in mining and separation of beach sand minerals in southern part of the country and established two more divisions; one at Chavara, Kerala and the other at Manavalakurichi, Tamil Nadu.

Operations
IRE operates three mining sites:

- Chavara Mineral Division (Q grade products)
- Manavalakurichi Mineral Division (Q grade products)
- Orissa Sands Complex (OSCOM) (OR grade products)

Chavara plant is located 10 km north of Kollam (formerly Quilon) and 85 km from Trivandrum, the capital of the State of Kerala. The plant operates on a mining area containing up to 40% heavy minerals and extending over a length of 23 km from Neendakara to Kayamkulam. Extensive deposits are mined by dry as well as wet (dredging) mining and mineral separation for the extraction of a high TiO₂ (about 60%) ilmenite, together with accessory rutile and zircon.

Current annual production capacity of the Chavara unit is 154,000 tonnes of ilmenite, 9,500 tonnes of rutile, 14,000 tonnes of zircon and 10,000 tonnes of sillimanite. Additionally, the plant has facilities for annual production of 6,000 tonnes of ground zircon called zirflor (+45 micron) and 500 tonnes of microzir (1-3 micron).

Manavalakurichi Mineral Division (MK grade products)
The MK mining and processing operations are situated 25 kms north of Cape Comorin, in the State of Tamil Nadu. Annual production is approximately 100,000 tonnes of ilmenite of 55-56% TiO₂ grade, 3,600 tonnes of rutile and 10,000 tonnes of zircon in addition to 4,000 tonnes of monazite and 12,800 tonnes of garnet.

OSCOM plant capacity is also undergoing a staged expansion, commencing with a new 600 tpa dredge. The first stage of expansion is expected to increase production capacity to 500,000 tpa of ilmenite and co-products by 2012.

Recent developments
In January 2011, IREL signed a memorandum of understanding with National Aluminium Company Limited to make value added products from beach sand and minerals. It is estimated that the project will cost Rs400 crore and is to be established in the Ganjam District in Orissa. The proposed titanium plant will reportedly produce titanium slag initially with the titanium plant following during a later phase of the project. Output from the slag and titanium plants will predominantly cater for domestic demand. For the year ending 31 March 2012, net profit for the period was reported at Rs 17,044.92 lakh.

In September 2012 it was also reported that IREL start production of Rare Earths Chloride at Monazite Processing Plant (MoPP) that is being commissioned at OSCOM, Odisha in 2013.
Titanium feedstocks are mainly used in the production of pigment, which accounts for more than xxx% of the world’s consumption of titanium minerals. The remainder is used in the production of titanium metal and fluxes for welding rods, and as a metallurgical flux in iron and steel making. Demand for titanium feedstocks has, therefore, been historically linked with that of TiO₂ pigment, an industry discussed in detail in the TiO₂ Pigment Annual Review 2013. Only a small number of large mining companies or groups are involved in the production of titanium feedstocks, and these are dominated by close relationships between producers (miners) and consumers (predominantly pigment producers). In 2012, the industry experienced the impact of slowing demand throughout the value chain as well as a number of strategic moves within the industry to curtail costs and maintain security of supply.

The largest feedstock producers are based in Africa and Australia. Xxx is the biggest producer of titanium feedstock in the world. The second-biggest feedstock producer is xxx. Xxx is the world’s third-largest feedstock producer as a result of xxx.

Feedstock demand and pricing

The sector has been negatively impacted by the debt crisis surrounding the Euro Zone and the economic slowdown experienced in China. Following a year of considerable demand growth, the titanium feedstock market in 2012 was influenced by a significant de-stocking phase among pigment producers. Demand for titanium dioxide (TiO₂) pigment appeared to be strong at the beginning of 2012, as it rebounded strongly from the dramatic decline experienced in Q4 2011. However, as the year progressed, declining sales of TiO₂ pigment resulted in high inventory levels; reaching 120 day sales of inventory (DSI) for certain plants at one point in time.

In addition, the sector has been negatively impacted by the debt crisis surrounding the Euro Zone and the economic slowdown experienced in China. During 2012, demand for titanium feedstocks declined significantly to xxx million TiO₂ units; down approximately xxx% year-on-year. Demand for feedstock by product type is shown in the following figure.

Feedstock demand by market: 2010–2014

Global demand for titanium feedstocks continues to be dominated by pigment manufacture, which accounted for xxx% of total consumption in 2012, while titanium metal and other uses each accounted for xxx% of demand. Demand for pigment feedstocks is estimated at xxx million TiO₂ units in 2012, much lower than that for 2011, and this directly correlates with a decline in global pigment production. Based on TZMI’s forecasts, a total increase in feedstock demand of xxx TiO₂ units is expected during the period to 2014: more than xxx% of which is likely to be influenced by demand growth in pigment manufacture.

Feedback demand by market type: 2010–2012

Following several consecutive price increases in 2011, feedback pricing appeared strong at the beginning of 2012. However, signs of market softening in the downstream TiO₂ pigment sector began to emerge in late Q2 2012.

Many pigment producers cut back on production, which in turn, reduced their requirement for titanium feedstocks and prices for several feedstock types fell substantially as a consequence.

The titanium industry involves key mineral sands commonly referred to as titanium feedstocks. These raw materials are used primarily in the production of titanium dioxide (TiO₂) pigment and, in smaller quantities, in the production of titanium metal and fluxes for welding rods. The most common mineral sands products are ilmenite, rutil and, to a lesser extent, leucoxene and zircon. The following figure shows the steps involved from mining through to major end-uses.

Feedstock supply

At the start of 2012, supply for most feedstock products, in particular high-grade titanium dioxide (TiO₂), remained tight. However, as the year progressed, it became clear that the economic deterioration in Europe and slowdown in China, together with a looming “fiscal cliff” in the US, had profoundly impacted global feedback offtake. Some feedback producers scaled back production at their mines in an effort to bring the feedback supply/demand ratio closer to balance and reduce costs.

TZMI has estimated the global supply of titanium feedstock in 2012 at xxx million TiO₂ units: down xxx% from 2011 levels. The relative market share of the feedstock types for 2012 remains largely consistent with 2011. Sulfate ilmenite accounts for the largest share of global feedback supply in terms of TiO₂ units. Chloride slag comprises the second largest share of feedback type supplied, accounting for around xxx% of global supply in 2012, and is the base load feedstock for chloride route pigment manufacture.